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I will close by thanking Counsellor Dolman for his criticisms. I am quite as fond of having my errors pointed out as the non-Euclidians are of having theirs exposed. My honest opinion, however, is that the Counsellor defended more errors than he corrected.

A Reply to Mr. Draughon. By H. C. Whitaker.

[Received in September, 1894.]

In reply to Mr. Draughon with reference to the equation $\sqrt{(x+4)}-\sqrt{(x-4)}=4$, I cannot agree with him that the minus sign before the radical $\sqrt{(x-4)}$ must necessarily be one of operation and that the direction of $\sqrt{(x-4)}$ is still ambiguous. I regard the sign as a combination of the two. To illustrate,—In the early portions of Algebra, it is usual to give problems such as $9+(-7)=?$ $9-(+7)=?$ $9-(--7)=?$; later in the subject, in enunciating exercises, these operations are supposed to be performed, and the single sign is deemed sufficient; thus, instead of saying $9+(-7)$ or $9-(+7)$, simply $9-7$ is used and I think no ambiguity arises from its use.

Now if Mr. Draughon means to imply that mathematical convention has not established the usage that in a polynomial a single sign before a radical of the second degree is not sufficient to indicate a particular root, I could refer him I presume to a hundred and probably a thousand references in the works of our best mathematicians where exactly that assumption is made. This idea is fundamental in the problem of rationalizing the denominator of a surd fraction, and it is the basis of the discussion of symmetry in plotting equations. Let me quote a few words from Olney's University Algebra, page 131, where the discussion of the solution of $x^2+px=q$ is taken up, the value of x having been found to be $-\frac{p}{2}\pm\sqrt{\frac{p^2}{4}+q}$: "When p and q are both positive, $-\frac{p}{2}+\sqrt{\frac{p^2}{4}+q}$ is positive and $-\frac{p}{2}-\sqrt{\frac{p^2}{4}+q}$ is negative. When p is negative and q positive, if we take the plus sign of the radical, x is positive, but if we take the minus sign, x is negative" and so on. I believe that Mr. Draughon himself would calculate $3+\sqrt{2}$ to be 4.4142+ and would be surprised if he were told the value was 1.5858 and would also be surprised if he were told that the expression as above written has no meaning, and that in order to make it intelligible, it must be written either $3++\sqrt{2}$ or $3--\sqrt{2}$. For myself, I see no advantage in using the two signs, and hope that, if Mr. Draughon advocates their use, the mathematical world will not adopt his suggestion. No discourtesy to Mr D. intended.

But even adopting this suggestion, we are as badly off as ever in answering L. B's question, if he amends it to read $+\sqrt{(x+4)}+-\sqrt{(x-4)}=4$, where the sign before the radicals now clearly indicates direction.

The total dissimilarity between this surd equation and the equation $x^2+2x=3$, which Mr. Draughon compares it to, can be seen by changing the signs of the various terms of the quadratic; in every case (3 more besides the given equation) new roots will be produced, the equations obtained being wholly dissimilar to the original equation; but no amount of changes of sign of the terms of $\sqrt{(x+a)}-\sqrt{(x-a)}-a=0$ can produce an equation which has more than one quarter of a chance of having one root, the product of the given equation and the equations obtained by changing signs giving only an equation of the first degree, while the product of $x^2+2x-3=0$, $x^2+2x+3=0$, $x^2-2x-3=0$ and $x^2-2x+3=0$, give an equation of the eighth degree.

It is undoubtedly true that by a hocus-pocus Mr. Draughon seems to make $+\sqrt{(x-4)}=-1$, but that was by doing exactly what I said was a wrong operation. Take his equation $x^2=3-2x$; square it; among the roots of this last equation will be found $x=1\pm\sqrt{-2}$, which will of course prove if we assume that x^2 must equal $3-2x$; as a matter of fact however for this value of x x^2 must $=-(3-2x)$ and the obtaining of the wrong sign for x^2 should have been a notification to go back and find the error in the work, just as obtaining $+\sqrt{(x-4)}=-1$ should have been in the other equation.

I am sorry that this comment is so long, but I wished to touch on all the points brought up by Mr. Draughon; I should be glad to answer any further objections which he may care to make.

EDITORIALS.

The Electrical World, in its issue of October 13th, published an appreciative sketch with portrait of our subscriber, Alexander Macfarlane, LL.D., late of the Chair of Physics in the University of Texas, and now of Cornell University, Ithaca, New York.

Professor William C. L. Gorton, Ph.D., of the Chair of Mathematics and Astronomy, Woman's College of Baltimore, died on November 9th, aged 28 years. Professor Gorton was a member of the American Mathematical Society.

Professor E. W. Nichols, of The Virginia Military Institute, Lexington, Va., and author of a recent and valuable text-book on *Analytic Geometry*, writes as follows: "Permit me to acknowledge the benefit I have received from the MONTHLY in my capacity as a professor of Mathematics. I place it each month in the hands of my classes and find it a great stimulus to independent endeavor."

We acknowledge the receipt of a pamphlet of 17 pages, by our contributor, Prof. Warren Holden, Girard College. Philadelphia, entitled "Oneness of Arithmetic," in which it is shown that most of the Rules of